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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Masashi OTSUKI, Shigeki ENDO,
Takao OGINO

Attn: PCT Branch

Application No. US National Stage of PCT/JP00/05053

Filed: January 25, 2002

Docket No.: 111788

For: NON-AQUEOUS ELECTROLYTE SECONDARY CELL

TRANSLATION OF THE ANNEXES TO THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

Attached hereto is a translation of the annexes to the International Preliminary Examination Report (Form PCT/IPEA/409). The attached translated material replaces page 5 of the specification and pages 72-74 of the claims .

Respectfully submitted,

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Date: January 25, 2002

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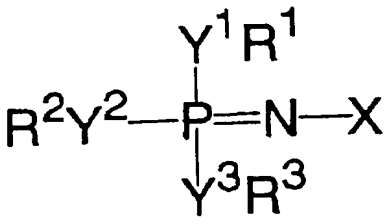
retardancy; has excellent resistance to deterioration and discharge properties at low temperatures; has therein a non-aqueous electrolyte having low interfacial resistance; and has excellent long-term stability since only a phosphate derivative is used as the solvent in the electrolyte; and is easy to fabricate.

DISCLOSURE OF THE INVENTION

The first aspect of the non-aqueous electrolyte cell of the invention that attains the first object as above comprises a non-aqueous electrolyte that contains lithium ions and more than 2.5 % by volume of a phosphagen derivative having a flash point of not lower than 100°C, and a positive electrode, and a negative electrode capable of absorbing and releasing lithium;

wherein the phosphagen derivative is represented by any of the following general formula (1) or (2):

Formula (1)



wherein R^1, R^2 and R^3 each represents a monovalent substituent or a halogen element; X represents an organic group containing at least one element selected from carbon, silicon, germanium,

tin, nitrogen, phosphorus, arsenic, antimony, bismuth, oxygen, sulfur, selenium, tellurium and polonium; and Y^1, Y^2 and Y^3 each represent a divalent linking group, a divalent element or a single bond,

Formula (2)

$$(PNR^4_2)n$$

wherein R^4 represents a monovalent substituent, or a halogen element; and n falls between 3 and 15.

The second aspect of the non-aqueous electrolyte secondary cell of the invention that attains the second object as above comprises a non-aqueous electrolyte that contains a supporting salt, an organic solvent and a phosphagen derivative, and a positive electrode, and a negative electrode; in which the potential window of the phosphagen derivative is such that its lowermost limit is +0.5 V or lower and its uppermost limit is +4.5 V or higher, and the potential window of the organic solvent is broader than that of the phosphagen derivative.

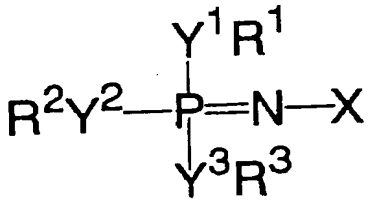
The third aspect of the non-aqueous electrolyte

CLAIMS

1. (Amended) A non-aqueous electrolyte cell comprising a non-aqueous electrolyte that contains lithium ions and more than 2.5 % by volume of a phosphagen derivative having a flash point of not lower than 100°C, and a positive electrode, and a negative electrode capable of absorbing and releasing lithium;

wherein the phosphagen derivative is represented by any of the following general formula (1) or (2):

Formula (1)



wherein R^1, R^2 and R^3 each represents a monovalent substituent or a halogen element; X represents an organic group containing at least one element selected from carbon, silicon, germanium, tin, nitrogen, phosphorus, arsenic, antimony, bismuth, oxygen, sulfur, selenium, tellurium and polonium; and Y^1, Y^2 and Y^3 each represents a divalent linking group, a divalent element or a single bond,

Formula (2)

$(PNR^4_2)n$

wherein R^4 represents a monovalent substituent, or a halogen

element; and n falls between 3 and 15.

2. The non-aqueous electrolyte cell as claimed in claim 1, wherein the viscosity at 25°C of the non-aqueous electrolyte is at most 10 mPa·s (cP).

3. The non-aqueous electrolyte cell as claimed in claim 1 or 2, wherein the non-aqueous electrolyte contains an aprotic organic solvent.

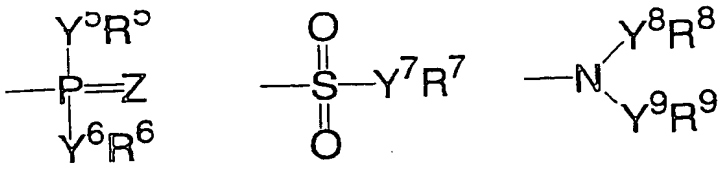
4. The non-aqueous electrolyte cell as claimed in claim 3, wherein the aprotic organic solvent is a cyclic ester compound.

5. The non-aqueous electrolyte cell as claimed in claim 4, wherein the cyclic ester compound contains ethylene carbonate or γ-butyrolactone.

6. (Amended) The non-aqueous electrolyte cell as claimed in claim 4, wherein the cyclic ester compound contains ethylene carbonate, and the non-aqueous electrolyte contains $LiPF_6$.

7. (Amended) The non-aqueous electrolyte cell as claimed in claim 1, wherein X in formula (1) is an organic group (A) of the following general formula (3):

Formula (3)



(A) (B) (C)

wherein R^5 to R^9 each represents a monovalent substituent or a halogen element; Y^5 to Y^9 each represent a divalent linking group, a divalent element or a single bond; and Z represents a divalent group or a divalent element.

8. A non-aqueous electrolyte secondary cell comprising a non-aqueous electrolyte that contains a supporting salt, an organic solvent and a phosphagen derivative, and a positive electrode, and a negative electrode;

wherein the potential window of the phosphagen derivative is such that its lowermost limit is at most +0.5 V and its uppermost limit is at least +4.5 V, and

the potential window of the organic solvent is wider than that of the phosphagen derivative.

9. The non-aqueous electrolyte secondary cell as claimed in claim 8, wherein the potential window of the phosphagen derivative is such that its lowermost limit is at most 0 V and its uppermost limit is at least +5 V.

10. The non-aqueous electrolyte secondary cell as claimed in claim 8 or 9, wherein the phosphagen derivative

satisfies at least one of the requirements that (1) its viscosity at 25°C is at most 100 mPa·s (100 cP), (2) its flash point is not lower than 100°C, and (3) its molecular structure has a halogen-containing substituent.

11. The non-aqueous electrolyte secondary cell as claimed in any of claims 8 to 10, wherein the organic solvent contains an aprotic organic solvent.

12. The non-aqueous electrolyte secondary cell as claimed in claim 11, wherein the aprotic organic solvent satisfies at least one of the requirements that (1) it contains any of cyclic ester compounds or linear ester compounds, and (2) its viscosity at 25°C is at most 100 mPa·s (100 cP).

13. The non-aqueous electrolyte secondary cell as